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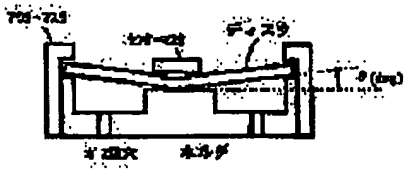
(54) SPUTTERING HOLDER FOR OPTICAL RECORDING MEDIUM AND PRODUCTION OF OPTICAL RECORDING MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To improve the warpage, tilt or the like of an optical recording medium and to produce the optical recording medium small in distortion, at the time of forming thin coating of an optical recording medium on a substrate by sputtering, by regulating the height of the contact position in the outer circumferential part and the inner circumferential part between a holder for holding a substrate and a substrate to different value.



SOLUTION: At the time of producing an optical disk by forming thin coating on the surface of a transparent substrate composed of polycarbonate by a sputtering method, the sputtering face in a disk is coated with acrylic ester series ultraviolet ray setting resin to produce an optical recording medium. In this case, as for the height of the position at which the substrate and the holder thereof is brought into contact with, the position of the outer circumferential part is made higher than the contact position in the inner circumferential part to regulate the angle θ [deg] formed in-between to tan θ>0.01, and moreover, the temp. of the substrate surface at the time of the sputtering is regulated to ≥40° C. The optical recording medium excellent in mechanical properties such as warpage, tilts, acceleration or the like and small in distortion can stably be produced.

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CLAIMS

[Claim(s)]
[Claim 1] The spatter holder for optical recording media which is a holder for holding an optical-recording-medium substrate at the time of a spatter, and is characterized by the height of the periphery section and the inner circumference section in contact with the substrate of the holder holding this substrate differing.
[Claim 2] The spatter holder for optical recording media according to claim 1 characterized by the periphery section of a holder being higher than the inner circumference section.
[Claim 3] It is theta (deg) about the include angle which receives horizontally and the amount of [a part for the attaching part of the inner circumference section of a holder and / of the periphery section] attaching part makes. Spatter holder for optical recording media according to claim 2 which will be characterized by tantheta becoming 0.01 or more if it carries out.
[Claim 4] The manufacture approach of the optical recording medium characterized by the height of the periphery section and the inner circumference section which are the manufacture approach of an optical recording medium of holding an optical-recording-medium substrate with a holder, and performing a spatter, and contact the substrate of the holder holding this substrate differing.
[Claim 5] The manufacture approach of the optical recording medium according to claim 4 characterized by being characterized by the periphery section of a holder being higher than the inner circumference section.

[Claim 6] It is theta (deg) about the include angle which receives horizontally and the amount of [a part for the attaching part of the inner circumference section of a holder and / of the periphery section] attaching part makes. The manufacture approach of the optical recording medium according to claim 4 which will be characterized by tantheta becoming 0.01 or more if it carries out.
[Claim 7] The manufacture approach of the optical recording medium according to claim 4 characterized by manufacturing on conditions from which the maximum temperature on the front face of a substrate at the time of a spatter becomes 40 degrees C or more.
[Claim 8] The manufacture approach of the optical recording medium according to claim 4 characterized by being the substrate with a thickness of 1.2mm or less with which the substrate carried out injection molding of the thermoplastics.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention improves mechanical characteristics, such as curvature of the optical recording medium after a spatter, a tilt, and acceleration, in a simple process, and relates to the spatter holder for producing an optical recording medium with little distortion, and the manufacture approach of the optical recording medium using it while it raises the productivity in manufacture of a phase change mold optical recording medium about the manufacture approach of an optical recording medium.
[0002]
[Description of the Prior Art] On the fabricated substrate, an optical recording medium prepares optically the information Records Department in which an account rec/play student is possible, and is used as disks for a file, such as a document and data. It is 1 micrometer, rotating an optical recording medium at high speed. Data are recorded for data on read-out or a record layer from a record layer, irradiating the laser light narrowed down to extent and performing focus control and location detection.
[0003] If a phase change mold optical recording medium is mentioned as an example, the concrete record playback approach will be performed by the following principles. At the time of record, the short-time exposure of the laser pulse which condensed in the record layer of a crystallized state is carried out, and a record layer is fused partially. Thermal diffusion quenches the fused part, it solidifies, and the record mark of amorphous state is formed. Information is optically reproduced using the description that the reflection factor of this record mark is lower than a crystallized state. Furthermore, at the time of elimination, laser light is irradiated into a record mark part, and by heating to the temperature beyond crystallization temperature, the record mark of amorphous state is crystallized and it returns to the condition of a basis of not recording, below the melting point of a record layer.
[0004] germanium2 Sb2 Te5 which uses a tellurium etc. as a principal component as this record layer ingredient etc. — the alloy (N. Yamada et al and Proc.Int.Symp.on Optical Memory 1987p61-66) is known. In the optical recording medium which used these Te alloy as the record layer, a crystallization rate is quick, exposure power is only modulated, and over-writing of the high speed by one circular beam is possible. In the optical recording medium which used these record layers, the dielectric layer which has thermal resistance and translucency was usually prepared in both sides of a record layer, and it has prevented deformation and puncturing occurring in a record layer at the time of record.
[0005]
[Problem(s) to be Solved by the Invention] Generally manufacture of such an optical recording medium fixes a substrate to a holder using an outer and an inner mask, and is performed by forming record film, a protective layer, etc. by approaches, such as a spatter. Then, although the optical recording medium was manufactured through the process of an overcoat etc., it was a manufacture overlay important point to manage so that the mechanical characteristic of the optical recording medium manufactured by the membrane stress at the time of a spatter etc. may not get worse.
[0006] Although it is in the inclination to shorten spatter time amount for the purpose of the formation of a short baton, in manufacture of the optical recording medium in recent years for the improvement in productive efficiency, compaction of spatter time amount is performed by raising spatter power in many cases. Although the dielectric layer was formed by the spatter which used the RF (RF) power source in the optical recording medium which has especially a dielectric layer, when spatter power was raised, and substrate skin temperature rose at the time of membrane formation of this dielectric layer, the problem that distortion of a resin substrate became large had arisen. This problem is the same also in formation of other layers, for example, a record layer.

[0007] For this reason, since substrate temperature at the time of a spatter is made low, it is possible to suppress the rise of substrate skin temperature by the approach of reducing spatter power, or the approach of enlarging spacing of a substrate and a target. However, in order to lower substrate temperature, it is necessary to lower a spatter rate sharply, and productive efficiency gets worse extremely. Moreover, although cooling a substrate compulsorily at the time of a spatter is also considered, since a cooling system is needed, it has the fault that a process becomes complicated.
[0008] Moreover, in order to make magnitude of a record mark smaller and to attain the densification of an optical recording medium, the optical head with the big numerical aperture which extracts laser light more and puts it is going to be adopted as a drive. Even if it uses the optical head of further more big numerical aperture, it is tended to make the substrate of an optical recording medium thin to 0.6mm thickness from 1.2mm thickness substrate used by CD or CD-ROM so far so that stable record playback can be performed. Therefore, the mechanical characteristic of the substrate which affects focusing and the tracking at the time of record playback will need to be managed more severely than former.
[0009] While the technical problem of this invention improves the trouble mentioned above and raises the productivity in manufacture of an optical recording medium, mechanical characteristics, such as curvature of the substrate after a spatter, a tilt, and acceleration, are improved in a simple process, without being accompanied by amelioration extensive in facility, and it aims at offering the approach of manufacturing an optical recording medium with little distortion.
[0010]
[Means for Solving the Problem] In order to solve said technical problem, this invention consists of the following configuration. That is, it is related with the spatter holder for optical recording media which is a holder for holding an optical-recording-medium substrate at the time of a spatter, and is characterized by the height of the periphery section and the inner circumference section in contact with the substrate of the holder holding this substrate differing.
[0011] Moreover, this invention is the manufacture approach of an optical recording medium of holding an optical-recording-medium substrate with a holder, and performing a spatter, and relates to the manufacture approach of the optical recording medium characterized by the height of the periphery section and the inner circumference section in contact with the substrate of the holder holding this substrate differing.
[0012]
[Embodiment of the Invention] Hereafter, the contents of this invention are explained in full detail.
[0013] Generally the spatter holder for optical recording media holds a record-medium substrate in the periphery and inner circumference part of the same height, as shown in drawing 2 and 3, and it has structure which maintains a substrate at a flat condition. In the holder of this invention, it is characterized by holding the substrate for record media not a flat but in the shape of a cone using the holder with which the height of the periphery section and the inner circumference section differs to a flat condition as shown, for example in drawing 1 .
[0014] By making it distorted in the direction contrary to the direction where a substrate curves, and performing a spatter, at the time of spatter termination, distortion of the substrate by the stress of the spatter film is reduced, and an optical recording medium with a good opportunity property is obtained.
[0015] According to the direction of the curvature of the substrate to be used, when a periphery part is high, or when the inner circumference section is high, either can be used for the periphery section holding a holder, and the inner circumference section, but since an inner circumference side curves upward in many cases, it is desirable to make the periphery section higher than the inner circumference section. The inclination of this holder section is theta (deg) about the include angle which the amount of [of the inner circumference section and the periphery section] attaching part makes to a flat condition. When it carries out, it is desirable that tantheta is 0.01-0.15, and it is more desirable that it is 0.03-0.12. The amelioration effectiveness of a mechanical characteristic is very small, and since distortion of the substrate when holding a substrate will become very large if it becomes large from 0.15, it is not desirable at less than 0.01.

[0016] A continuous thing is more desirable, although the amount of [of a holder periphery part] attaching part may be continuous on the whole periphery or it may be discontinuous. Moreover, both the approach of supporting by two points, a periphery and inner circumference, so that it may illustrate to drawing 1 as a part supporting a disk the approach of supporting from inner circumference to a periphery by part for the attaching part of the shape of two or more concentric circle so that it may illustrate to drawing 4 the approach of supporting from inner circumference continuously to a periphery, etc. can be used. What prepared the vent hole for removing the gas which supports by two points, inner circumference and the

periphery section, so that it may illustrate to drawing 1 especially, and occurs from a substrate in a part for a core is the most desirable.
[0017] Although the spatter of the dielectric layer is carried out with a RF (RF) power source when manufacturing the optical recording medium of this invention for example, it is desirable to raise the spatter rate at the time of this dielectric layer spatter, and to perform it for a productivity drive. How to make small spacing of making spatter power high or a substrate, and a target as an approach of raising a spatter rate can be considered. Even if it raises a spatter rate according to this invention until surface substrate temperature becomes 40 degrees C or more although it is important in order for holding down substrate skin temperature to less than 40 degrees C in a conventional method to obtain the good record medium of a mechanical characteristic at this time, the good record medium of a mechanical characteristic can be obtained. Moreover, further, 50 degrees C or more of good record media of a mechanical characteristic can be obtained, even if it performs a spatter above 60 degrees C.
[0018] The optical recording medium concerning this invention has a record layer and a protective layer at least on a substrate. The laminating configuration which is constituted by two or more laminated structures, for example, prepared the 1st layer (the 1st protective layer) / the 2nd layer (record layer) / the 3rd layer (the 2nd protective layer) / the 4th layer (reflecting layer) on the substrate preferably at this order. Or the 1st layer (the 1st protective layer) / the 2nd layer (record layer) / the 3rd layer (the 2nd protective layer) / the 4th layer (light absorption layer) / the 5th layer (reflecting layer) is mentioned.
[0019] The effectiveness of improving the signal contrast at the time of playback according to the corrosion prevention of a record layer, degradation prevention of the recording characteristic produced in deformation by heat, such as a substrate and a record layer, at the time of record, and optical cross protection has the effectiveness of the 1st and 2nd protective layers. The 1st protection layer thickness in this case is usually set to 50nm - 400nm. The thickness of the 2nd protective layer is [that there is little degradation of the recording characteristic by repetition of rewriting] excellent in the point that the power margin of elimination power is large with the "quenching structure" thinly constituted in about 20nm compared with the "annealing structure" which made the dielectric layer thick to about 200nm. Therefore, as for the 2nd protection layer thickness, it is desirable that it is 10nm - 100nm.
[0020] as such a protective layer — ZnS, SiO2, Ta 2O5, and ITO, ZrC, TiC and MgF2 etc. — inorganic film and those mixed film can be used. It is especially ZnS and SiO2. And ZnS and MgF2 Since the mixed film is excellent in resistance to moist heat and controls degradation at the time of record elimination further, it is desirable. moreover, these — carbon and MgF2 etc. — what mixed the fluoride is desirable from membranous residual stress being small. It is especially ZnS and SiO2. The mixed film, or ZnS and SiO2 The carbonaceous mixed film is ZnS and SiO2 especially preferably from the ability of degradation of record sensibility, C/N, the rate of elimination, etc. not to break out easily also due to the repeat of record and elimination. The carbonaceous mixed film is desirable.
[0021] It is desirable to use the alloy which contains three elements of germanium, Sb, and Te at least as a configuration element as a record layer from the point [over-write / point] at high speed. Furthermore, as for the presentation, it is desirable that it is in the range expressed with a degree type from thermal stability and the point of excelling in stability repeatedly.
[0022]
Mz1(Sbx Te 1-x)-y-z y (germanium0.5 Te0.5) — 0.35<=x<=0.50.2<=y<=0.50.0005<=z<=0.01 — here, at least, in a kind of metal with which M is chosen from palladium, niobium, platinum, silver, gold, and cobalt, and Sb, antimony and Te express a tellurium and germanium expresses germanium. Moreover, x, y and z, and a figure express the number of the atoms of each element (mol of each element number). About palladium and especially niobium, it is desirable that a kind is included at least.
[0023] While the light reflex layer formed on the 2nd protective layer or a light absorption layer improves the signal contrast at the time of playback according to optical cross protection, the technique of making formation of the record mark of amorphous state easy, and improving an elimination property and a repeat property according to the cooling effect is known. As this record layer membrane thickness, it is desirable that it is 10-100nm.
[0024] As the quality of the material of a reflecting layer, metals, such as aluminum, Au, etc. which have light reflex nature, and these are made into a principal component, and what mixed metallic compounds, such as metal nitrides, such as aluminum and Si, a metallic oxide, and a metal chalcogen ghost, is raised to metals containing alloying elements, such as Ti, Cr, and Hf, such as an alloy, and aluminum, Au. Metals, such as aluminum and Au, and the alloy which makes these a principal component have high light reflex nature, and it is desirable from the ability to make thermal conductivity high. As an example of the above-mentioned alloy, there is a thing which added at least one sort of elements, such as Si, Mg, Cu, Pd, Ti, Cr,

Hf, Ta, Nb, and Mn, to aluminum more than 1 atom % below pentatomic % in total, or a thing which added at least one sort of elements, such as Cr, Ag, Cu, Pd, Pt, and nickel, to Au more than below 20 atom %1 atom % in total. The alloy which uses aluminum as a principal component since the price of an ingredient is made especially at a low price is desirable, and it divides, and since corrosion resistance is good, the alloy which added in total at least one or more sorts of metals chosen as aluminum from Ti, Cr, Ta, Hf, Zr, Mn, and Pd more than below pentatomic %0.5 atom % is desirable. Corrosion resistance is good, and since generating of a hillock etc. cannot take place easily, the alloy which uses one aluminum of under 3 atom % ****, an aluminum-Hf-Pd alloy, an aluminum-Hf alloy, an aluminum-Ti alloy, an aluminum-Ti-Hf alloy, an aluminum-Cr alloy, an aluminum-Ta alloy, an aluminum-Ti-Cr alloy, and an aluminum-Si-Mn alloy as a principal component for an alloying element more than 0.5 atom % in total is especially desirable as a reflecting layer ingredient.

[0025] As a substrate for record media, in order to perform record playback from a substrate side, it is desirable to use the ingredient which laser light penetrates good, for example, it can use organic macromolecule resin, such as polymethylmethacrylate resin, polycarbonate resin, polyolefin resin, and an epoxy resin, those mixture, a copolymer object, etc. inside — polycarbonate resin — from a viewpoint of an optical property and thermal resistance — most — good ********** — things are made.

[0026] A disc-like substrate is produced by injection molding or injection compression molding, using this thermoplastics. At the time of this substrate molding, it equips with La Stampa by which a predetermined groove and a predetermined pit male were formed in the front face in metal mold, and the substrate with which the desired truck was formed in the front face of the imprint from La Stampa is fabricated.

[0027] It is necessary to double the magnitude of a substrate with demand specification from optical-recording-medium drive equipment. For example, as a diameter, the substrate (80mm, 90mm, 120mm, or 130mm) etc. is specified. Although 1.2mm thru/or 0.6mm are usually used as thickness, since the one where substrate thickness is thinner appears notably, especially in the case of 0.6mm or less, effectiveness is high [the effectiveness of this invention] 1mm or less.

[0028] The laminating of the 1st layer / the 2nd layer / the 3rd layer / the 4th layer is carried out at least on such a substrate. An organic resin protective layer may be prepared on this layer. As an organic resin protective layer, the photo-setting resin constituent which uses a polymerization nature monomer and oligomer as a principal component, and a thermosetting resin constituent are used, and, generally it is formed by the spin coat method. Moreover, the protective layer which consists of same organic resin constituent can also be prepared on the substrate by the side of the plane of incidence of light for the purpose of substrate protection, such as abrasion resistance and improvement in print durability, and the purpose of the antielectricity characteristic grant for dust antisticking.

[0029]

[Example]

The spatter of the thin film of a configuration of being shown below was carried out using the sputtering system using the holder shown in example 1 drawing 1 on the transparence substrate which consists of a polycarbonate with a diameter of 120mm on the conditions shown in Table 1, and the optical disk was produced. Thickness of each class was performed carrying out a monitor by the crystal oscillator type thickness gage. When the temperature on a transparence substrate was measured using the nonreversible temperature seal tape, skin temperature was 70 degrees C.

[0030] It is 8 micrometers about acrylic ester system ultraviolet-rays hardening resin by the spin coat method to the spatter side of the obtained disk. It formed and the optical recording medium was obtained. Furthermore, the beam of semiconductor laser with a wavelength of 820nm was irradiated at this optical recording medium, the record layer of the whole disk surface was crystallized, and it initialized.

[0031] Here, the include angle which the amount of [of the inner circumference section and the periphery section] attaching part makes to a level condition as it was indicated in drawing as theta is said.

[0032]

The 1st layer The 1st protective layer 80ZnS-20SiO2 (mol%) 160nm The 2nd layer Record layer 55Te19germanium26Sb 25nm The 3rd layer The 2nd protective layer 80ZnS-20SiO2 (mol%) 40nm The 4th layer Reflecting layer aluminum 100nm The mechanical characteristic of an optical recording medium was measured after day neglect in the state of the temperature of 23 degrees C, and 50% of humidity with the mechanical characteristic measuring device (the Ono Sokki [Co., Ltd.] Co., Ltd. make, LM100). The amount (DEF) of disk curvatures and tilt angle of a record-medium periphery part (radius of 56mm) are shown in Table 1.

[0033] The optical disk was produced like the example 1 except having changed an example 2 - 4 substrate thickness, and theta, as shown in Table 1. A result is shown in Table 1.

[0034] The disk was produced like the example 1 except having used the holder which shows the example 1 of a comparison – 2 substrate thickness, and theta in Table 1, and is shown in drawing 3 . A result is shown in Table 1. The substrate skin temperature at the time of a spatter was 70 degrees C similarly.

[0035]

[Table 1]

(1)表1　光記録媒体の機械特性

(2)		基板厚み (mm)	tan θ	DEF (μm)	チルト (3) (mrad)
実施例 (4)	1	1.2	0.0167	66	3.1
	2		0.0333	52	2.1
	3	0.6	0.0167	88	4.1
	4		0.0333	76	3.5
比較例 (5)	1	1.2	0.0000	101	6.8
	2	0.6	0.0000	120	8.3

(1) Table 1
Mechanical characteristic of optical recording medium
(2) Substrate thickness
(3) Tilt
(4) Examples
(5) Comparative examples

The result shown in Table 1 shows that the mechanical characteristic of an optical recording medium is improved by using the holder of this invention.

[0036]

[Effect of the Invention] According to this invention, in manufacture of an optical recording medium, while raising productivity, mechanical characteristics, such as curvature of the optical recording medium after a spatter, a tilt, and acceleration, can be improved in a simple process, and an optical disk with little distortion can be produced.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of one gestalt of the spatter holder of this invention is expressed.
[Drawing 2] The plan of a spatter holder is expressed.
[Drawing 3] The sectional view of the conventional spatter holder is expressed.
[Drawing 4] The sectional view of one gestalt of the spatter holder of this invention is expressed.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

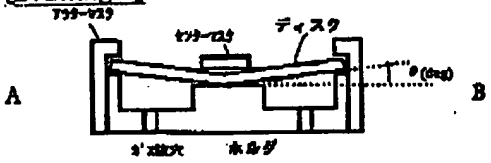

図1　実施例（ＡＢ面断面図）

[Drawing 2]

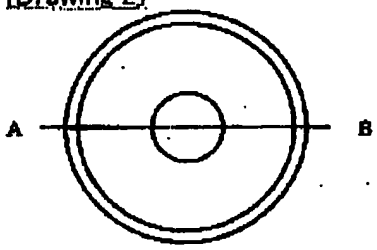

図2　ホルダ上面図

[Drawing 3]

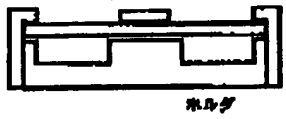

図3　従来例（ＡＢ面断面図）

[Drawing 4]

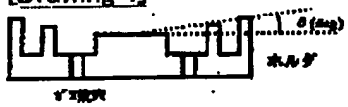

図4　実施例（ＡＢ面断面図）

[Translation done.]

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TITLE: SPUTTERING HOLDER FOR OPTICAL RECORDING MEDIUM AND PRODUCTION OF OPTICAL RECORDING MEDIUM

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ABSTRACT:

PROBLEM TO BE SOLVED: To improve the warpage, tilt or the like of an optical recording medium and to produce the optical recording medium small in distortion, at the time of forming thin coating of an optical recording medium on a substrate by sputtering, by regulating the height of the contact position in the outer circumferential part and the inner circumferential part between a holder for holding a substrate and a substrate to different

value.

SOLUTION: At the time of producing an optical disk by forming thin coating on the surface of a transparent substrate composed of polycarbonate by a sputtering method, the sputtering face in a disk is coated with acrylic ester series ultraviolet ray setting resin to produce an optical recording medium. In this case, as for the height of the position at which the substrate and the holder thereof is brought into contact with, the position of the outer circumferential part is made higher than the contact position in the inner circumferential part to regulate the angle θ [deg] formed in-between to tan θ>0.01, and moreover, the temp. of the substrate surface at the time of the sputtering is regulated to ≥40°C. The optical recording medium excellent in mechanical properties such as warpage, tilts, acceleration or the like and small in distortion can stably be produced.

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

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審査請求　未請求　請求項の数８　ＯＬ　（全 ６ 頁）

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(54)【発明の名称】　光記録媒体用スパッタホルダおよび光記録媒体の製造方法

(57)【要約】
【課題】光記録媒体の反り、チルト、加速度等の機械特性を改善し、歪みの少ない光記録媒体を作製する。
【解決手段】ホルダに記録媒体基板を保持し、少なくとも記録層をスパッタする光記録媒体の製造方法において、該基板を保持するホルダーの基板に接触する外周部と内周部との高さが異なることを特徴とする光記録媒体用スパッタホルダおよびそれを用いた光記録媒体の製造方法。

1

【特許請求の範囲】

【請求項1】スパッタ時に光記録媒体基板を保持するためのホルダであって、該基板を保持するホルダの基板に接触する外周部と内周部との高さが異なることを特徴とする光記録媒体用スパッタホルダ。

【請求項2】ホルダの外周部が内周部より高くなっていることを特徴とする請求項1記載の光記録媒体用スパッタホルダ。

【請求項3】水平方向に対してホルダの内周部の保持部分と外周部の保持部分がなす角度をθ(deg)とすると、tanθが0.01以上となることを特徴とする請求項2記載の光記録媒体用スパッタホルダ。

【請求項4】光記録媒体基板をホルダで保持してスパッタを行う光記録媒体の製造方法であって、該基板を保持するホルダの基板に接触する外周部と内周部との高さが異なることを特徴とする光記録媒体の製造方法。

【請求項5】ホルダの外周部が内周部より高くなっていることを特徴とすることを特徴とする請求項4記載の光記録媒体の製造方法。

【請求項6】水平方向に対してホルダの内周部の保持部分と外周部の保持部分がなす角度をθ(deg)とすると、tanθが0.01以上となることを特徴とする請求項4記載の光記録媒体の製造方法。

【請求項7】スパッタ時の基板表面の最高温度が40℃以上となるような条件で製造することを特徴とする請求項4記載の光記録媒体の製造方法。

【請求項8】基板が熱可塑性樹脂を射出成形した厚み1.2mm以下の基板であることを特徴とする請求項4記載の光記録媒体の製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は光記録媒体の製造方法に関し、特に相変化型光記録媒体の製造における生産性を向上させるとともに、簡易なプロセスでスパッタ後の光記録媒体の反り、チルト、加速度等の機械特性を改善し、歪みの少ない光記録媒体を作製するためのスパッタホルダおよびそれを用いた光記録媒体の製造方法に関するものである。

【0002】

【従来の技術】光記録媒体は、成形された基板上に光学的に記録再生可能な情報記録部を設け、文書やデータ等のファイル用ディスクとして用いられている。光記録媒体を高速で回転させながら、1μm程度に絞り込んだレーザー光を照射し、焦点調整および位置検出を行いながら、記録層からデータを読出し、または記録層にデータを記録する。

【0003】相変化型光記録媒体を例に挙げると、具体的な記録再生方法は以下のような原理で行われる。記録時には結晶状態の記録層に集光したレーザーパルスを短時間照射し、記録層を部分的に溶融する。溶融した部分

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は熱拡散により急冷され、固化し、非晶状態の記録マークが形成される。この記録マークの反射率が結晶状態よりも低いという特徴を利用して光学的に情報を再生する。さらに、消去時には記録マーク部分にレーザー光を照射し、記録層の融点以下、結晶化温度以上の温度に加熱することによって非晶状態の記録マークを結晶化し、もとの未記録状態に戻す。

【0004】この記録層材料としては、テルルなどを主成分とする$Ge_2Sb_2Te_5$などの合金(N.Yamada et al, Proc. Int. Symp. on Optical Memory 1987 p61-66)が知られている。これらTe合金を記録層とした光記録媒体では、結晶化速度が速く、照射パワーを変調するだけで、円形の1ビームによる高速のオーバーライトが可能である。これらの記録層を使用した光記録媒体では、通常、記録層の両面に耐熱性と透光性を有する誘電体層を設け、記録時に記録層に変形、開孔が発生することを防いでいる。

【0005】

【発明が解決しようとする課題】このような光記録媒体の製造は、一般にアウターおよびインナーマスクを用いて基板をホルダに固定し、スパッタ等の方法で記録膜、保護層等を形成することによって行われる。その後、オーバーコート等の工程を経て光記録媒体が製造されるが、スパッタ時における膜応力等により製造される光記録媒体の機械特性が悪化しないよう管理することが製造上重要であった。

【0006】近年における光記録媒体の製造において生産効率向上のため、短タクト化を目的にスパッタ時間を短縮化させる傾向にあるが、スパッタ時間の短縮はスパッタパワーを上昇させることにより行われることが多い。特に誘電体層を有する光記録媒体では誘電体層を高周波(RF)電源を用いたスパッタにより形成するが、スパッタパワーを上昇させると、この誘電体層の成膜時に基板表面温度が上昇することにより、樹脂基板の歪みが大きくなるという問題が生じていた。この問題は他の層、例えば記録層の形成においても同様である。

【0007】このため、スパッタ時の基板温度を低くするため、スパッタパワーを低下させる方法や基板とターゲットの間隔を大きくする方法によって基板表面温度の上昇を抑えることが考えられる。しかし、基板温度を下げるためには大幅にスパッタレートを下げる必要があり、生産効率が極端に悪化する。また、基板をスパッタ時に強制的に冷却することも考えられるが、冷却装置が必要となるためプロセスが複雑となるという欠点を有する。

【0008】また、記録マークの大きさをより小さくして光記録媒体の高密度化を達成するために、レーザー光をより絞り込める大きな開口数を持つ光ヘッドがドライブに採用されようとしている。さらにはより大きな開口数の光ヘッドを使用しても安定な記録再生を行えるよう

光記録媒体の基板はこれまでＣＤやＣＤ－ＲＯＭで用いられてきた１．２ｍｍ厚基板から０．６ｍｍ厚へと薄くする方向にある。そのため、記録再生時のフォーカシングやトラッキングに影響を与える基板の機械特性は今まで以上に厳しく管理する必要が生じている。

【０００９】本発明の課題は上述した問題点を改良し、光記録媒体の製造における生産性を向上させるとともに、設備的に大幅な改良をともなうことなく簡易なプロセスでスパッタ後の基板の反り、チルト、加速度等の機械特性を改善し、歪みの少ない光記録媒体を製造する方法を提供することを目的とする。

【００１０】

【課題を解決するための手段】前記課題を解決するために、本発明は下記の構成からなる。すなわち、スパッタ時に光記録媒体基板を保持するためのホルダであって、該基板を保持するホルダの基板に接触する外周部と内周部との高さが異なることを特徴とする光記録媒体用スパッタホルダに関するものである。

【００１１】また、本発明は、光記録媒体基板をホルダで保持してスパッタを行う光記録媒体の製造方法であって、該基板を保持するホルダの基板に接触する外周部と内周部との高さが異なることを特徴とする光記録媒体の製造方法に関するものである。

【００１２】

【発明の実施の形態】以下、本発明の内容について詳述する。

【００１３】光記録媒体用のスパッタホルダは図２、３に示すように一般に記録媒体基板を同じ高さの外周と内周部分で保持し、基板をフラットな状態に保つような構造となっている。本発明のホルダにおいては、例えば図１に示すようにフラットな状態に対して外周部と内周部との高さが異なるホルダを用いて、記録媒体用基板をフラットではなく円錐状に保持することを特徴とする。

【００１４】基板が反る方向と逆の方向に、歪ませてスパッタを行うことにより、スパッタ終了時に、スパッタ膜の応力による基板の歪みが低減され、機会特性の良好な光記録媒体が得られるのである。

【００１５】ホルダを保持する外周部と内周部は、用いる基板の反りの方向によって外周部分が高い場合または内周部が高い場合どちらでも用いることができるが、内周側が上向きに反る場合が多いので、外周部を内周部より高くすることが好ましい。このホルダ部の傾きは、フラットな状態に対して内周部と外周部の保持部分がなす角度をθ(deg)とすると、$\tan\theta$が０．０１～０．１５であることが好ましく、０．０３～０．１２であることがより好ましい。０．０１未満では機械特性の改良効果は非常に小さく、０．１５より大きくなると基板を保持した時の基板の歪みが非常に大きくなるため好ましくない。

【００１６】ホルダ外周部分の保持部分は、円周全体に連続的であっても不連続であっても良いが、連続的であることがより好ましい。また、ディスクを支える部分としては図１に例示するように外周と内周の２点で支える方法、図４に例示するように内周から外周へと複数の同心円状の保持部分で支える方法、及び内周から外周へと連続的に支える方法等のいずれも用いることができる。中でも図１に例示するように内周と外周部の２点で支え、中心部分に基板から発生するガスを取り除くためのガス抜き穴を設けたものが最も好ましい。

【００１７】本発明の光記録媒体を製造する場合、例えば誘電体層を高周波（ＲＦ）電源でスパッタするが、生産性向上のためこの誘電体層スパッタ時のスパッタレートを上昇させて行うことが好ましい。スパッタレートを上昇させる方法としては、スパッタパワーを高くすること、または基板とターゲットの間隔を小さくする方法が考えられる。この時、従来法では基板表面温度を４０℃未満に抑えることが、機械特性の良好な記録媒体を得るには、重要であるが、本発明によれば、表面基板温度が４０℃以上になるまでスパッタレートを上昇させても、機械特性の良好な記録媒体を得ることができる。また、５０℃以上、さらには、６０℃以上でスパッタを行っても、機械特性の良好な記録媒体を得ることができる。

【００１８】本発明に係る光記録媒体は、基板上に少なくとも記録層と保護層を有するものである。好ましくは、複数の積層構造に構成されており、たとえば基板上に第１層（第１保護層）／第２層（記録層）／第３層（第２保護層）／第４層（反射層）をこの順に設けた積層構成、または第１層（第１保護層）／第２層（記録層）／第３層（第２保護層）／第４層（光吸収層）／第５層（反射層）などが挙げられる。

【００１９】第１及び第２保護層の効果は、記録層の腐食防止、記録時に基板、記録層などの熱による変形で生じる記録特性の劣化防止、光学的な干渉効果により再生時の信号コントラストを改善する効果がある。この場合の第１保護層の厚さは、通常５０ｎｍ～４００ｎｍとされる。第２保護層の厚みは２０ｎｍ程度に薄く構成した「急冷構造」では、誘電体層を２００ｎｍ程度に厚くした「徐冷構造」に比べ、書換の繰返しによる記録特性の劣化が少なく、また消去パワーのパワー・マージンが広い点で優れている。従って、第２保護層の厚さは１０ｎｍ～１００ｎｍであることが好ましい。

【００２０】このような保護層としては、ＺｎＳ、SiO_2、Ta_2O_5、ＩＴＯ、ＺｒＣ、ＴｉＣ、MgF_2などの無機膜やそれらの混合膜が使用できる。特にＺｎＳとSiO_2およびＺｎＳとMgF_2の混合膜は耐湿熱性に優れており、さらに記録消去時の劣化を抑制するので好ましい。また、これらに炭素や、MgF_2などのフッ化物を混合したものも、膜の残留応力が小さいことから好ましい。特にＺｎＳとSiO_2の混合膜あるいは、ＺｎＳとSiO_2と炭素の混合膜は、記録、消去の繰り

返しによっても、記録感度、C／N、消去率などの劣化が起きにくいことから好ましく特にZnSとSiO$_2$と炭素の混合膜が好ましい。

【0021】記録層としては、構成元素として少なくともGe、Sb、Teの3元素を少なくとも含む合金を用いることが高速でオーバーライトが可能である点から好ましい。さらに、その組成は次式で表される範囲にあることが熱安定性と繰返し安定性に優れている点から好ましい。

【0022】

$M_z (Sb_x Te_{1-x})_{1-y-z} (Ge_{0.5} Te_{0.5})_y$

$0.35 \leqq x \leqq 0.5$

$0.2 \leqq y \leqq 0.5$

$0.0005 \leqq z \leqq 0.01$

ここで、Mはパラジウム、ニオブ、白金、銀、金、コバルトから選ばれる少なくとも一種の金属、Sbはアンチモン、Teはテルル、Geはゲルマニウムを表す。また、x、y、z、及び数字は、各元素の原子の数（各元素のモル数）を表す。特に、パラジウム、ニオブについては少なくとも一種を含むことが好ましい。

【0023】第2保護層または光吸収層の上に形成された光反射層は、光学的な干渉効果により、再生時の信号コントラストを改善すると共に、冷却効果により、非晶状態の記録マークの形成を容易にし、かつ消去特性、繰り返し特性を改善する技術が知られている。この記録層膜厚としては、10～100nmであることが好ましい。

【0024】反射層の材質としては、光反射性を有するAl、Auなどの金属、及びこれらを主成分とし、Ti、Cr、Hfなどの添加元素を含む合金及びAl、Auなどの金属にAl、Siなどの金属窒化物、金属酸化物、金属カルコゲン化物などの金属化合物を混合したものなどがあげられる。Al、Auなどの金属、及びこれらを主成分とする合金は、光反射性が高く、かつ熱伝導率を高くできることから好ましい。前述の合金の例として、AlにSi、Mg、Cu、Pd、Ti、Cr、Hf、Ta、Nb、Mnなどの少なくとも1種の元素を合計で5原子%以下、1原子%以上加えたもの、あるいは、AuにCr、Ag、Cu、Pd、Pt、Niなどの少なくとも1種の元素を合計で20原子%以下1原子%以上加えたものなどがある。特に、材料の価格が安くできることから、Alを主成分とする合金が好ましく、とりわけ、耐腐食性が良好なことから、AlにTi、Cr、Ta、Hf、Zr、Mn、Pdから選ばれる少なくとも1種以上の金属を合計で5原子%以下0.5原子%以上添加した合金が好ましい。とりわけ、耐腐食性が良好でかつヒロックなどの発生が起こりにくいことから、添加元素を合計で0.5原子%以上3原子%未満含む、Al－Hf－Pd合金、Al－Hf合金、Al－Ti合金、Al－Ti－Hf合金、Al－Cr合金、Al－Ta合金、Al－Ti－Cr合金、Al－Si－Mn合金のいずれかのAlを主成分とする合金が反射層材料として好ましい。

【0025】記録媒体用の基板としては、基板側から記録再生を行うためにはレーザー光が良好に透過する材料を用いることが好ましく、たとえばポリメチルメタクリレート樹脂、ポリカーボネート樹脂、ポリオレフィン樹脂、エポキシ樹脂などの有機高分子樹脂、それらの混合物、共重合体物などを用いることができる。中でも、ポリカーボネート樹脂を光学特性と耐熱性の観点から最も好まく用いることができる。

【0026】この熱可塑性樹脂を用いて、例えば射出成形や射出圧縮成形によって円板状の基板を作製する。この基板成型時、金型内に所定のグルーブやピット雄型が表面に形成されたスタンパを装着し、スタンパからの転写により表面に所望のトラックが形成された基板を成形する。

【0027】基板の大きさは光記録媒体ドライブ装置からの要求規格に合わせる必要がある。例えば、直径としては80mm、90mm、120mmまたは130mmの基板等が規定されている。厚みとしては1．2㎜ないし0．6㎜が通常用いられるが、本発明の効果は、基板厚みが薄い方が、顕著にあらわれるため、1㎜以下、特に0．6㎜以下の場合に効果が高い。

【0028】このような基板上に少なくとも第1層／第2層／第3層／第4層が積層される。この層の上には有機樹脂保護層を設けても良い。有機樹脂保護層としては、重合性モノマーおよびオリゴマーを主成分とする光硬化性樹脂組成物や、熱硬化性樹脂組成物が用いられ、スピンコート法によって一般に形成される。また、同様な有機樹脂組成物からなる保護層を光の入射面側の基板上に、耐摩耗性、耐刷性向上などの基板保護の目的や、ホコリ付着防止のための制電性付与の目的で設けることもできる。

【0029】

【実施例】

実施例1

図1に示すホルダを用いて、表1に示す条件で直径120mmのポリカーボネートからなる透明基板上に以下に示す構成の薄膜をスパッタリング装置を用いてスパッタし、光ディスクを作製した。各層の膜厚は水晶発振子式膜厚計によりモニタしながら行った。非可逆性の温度シールテープを用いて透明基板上の温度を測定したところ、表面温度は70℃であった。

【0030】得られたディスクのスパッタ面にスピンコート法によってアクリル酸エステル系紫外線硬化樹脂を8μm 形成し、光記録媒体を得た。さらに、この光記録媒体に波長820nmの半導体レーザーのビームを照射して、ディスク全面の記録層を結晶化させ、初期化した。

【0031】ここで、θとは図に示したように水平状態に対して内周部と外周部の保持部分がなす角度をいう。

第1層	第1保護層	80ZnS－20SiO$_2$ (mol%)	160nm
第2層	記録層	55Te19Ge26Sb	25nm
第3層	第2保護層	80ZnS－20SiO$_2$ (mol%)	40nm
第4層	反射層	Al	100nm

温度23℃、湿度50%の状態で一日放置後、光記録媒体の機械特性を機械特性測定装置（小野測器（株）社製、LM100）で測定した。表1に記録媒体外周部分（半径56mm）のディスク反り量（DEF）とチルト角を示す。

【0033】実施例2～4

基板厚みおよびθを表1に示すように変えた以外は、実施例1と同様にして光ディスクを作製した。結果を表1※に示す。

【0034】比較例1～2

基板厚みおよびθを表1に示すようにし、図3に示すホルダを用いた以外は、実施例1と同様にしてディスクを作製した。結果を表1に示す。スパッタ時の基板表面温度は同様に70℃であった。

【0035】

【表1】

表1　光記録媒体の機械特性

		基板厚み (mm)	tanθ	DEF (μm)	チルト (mrad)
実施例	1	1.2	0.0167	66	3.1
	2		0.0333	52	2.1
	3	0.6	0.0167	88	4.1
	4		0.0333	76	3.5
比較例	1	1.2	0.0000	101	6.8
	2	0.6	0.0000	120	8.3

表1に示す結果から、本発明のホルダを用いることによって光記録媒体の機械特性が改善されることがわかる。

【0036】

【発明の効果】本発明によれば、光記録媒体の製造において、生産性を向上させるとともに、簡易なプロセスでスパッタ後の光記録媒体の反り、チルト、加速度等の機械特性を改善し、歪みの少ない光ディスクを作製することができる。

★【図面の簡単な説明】

【図1】本発明のスパッタホルダの一形態の断面図を表す。

【図2】スパッタホルダの上面図を表す。

【図3】従来のスパッタホルダの断面図を表す。

【図4】本発明のスパッタホルダの一形態の断面図を表す

【図1】

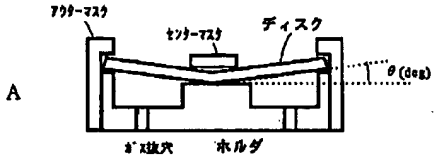

図1　実施例（AB面断面図）

【図2】

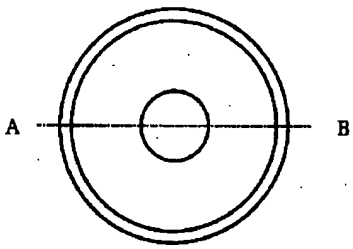

図2　ホルダ上面図

【図3】

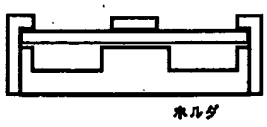

図3　従来例（AB面断面図）

【図4】

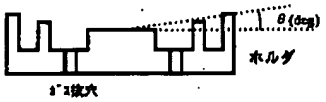

図4　実施例（AB面断面図）